



W E L C O M E

RITA Intelligent Transportation Systems
Joint Program Office

Welcome



**Shelley Row, P.E., PTOE
Director**
ITS Joint Program Office
Shelley.Row@dot.gov

The screenshot shows the RITA website header with the logo and navigation menu. The main content area is titled "ITS Professional Capacity Building Program" and includes sections for "Welcome to ITS Professional Capacity Building", "ITS Technical Assistance", "News", and "Scheduled T3 Webinars".

Updated June 3, 2011

ITS Professional Capacity Building Program

Welcome to ITS Professional Capacity Building

The ITS Professional Capacity Building (PCB) Program provides comprehensive, accessible, and flexible ITS learning for the transportation industry. By using the program, public agencies can build and sustain a capable and technically proficient ITS workforce, and transportation professionals can develop their knowledge, skills, and abilities while furthering their career paths.

The plan, [ITS Professional Capacity Building: Setting Strategic Direction 2010-2014](#), describes the strategy the ITS PCB Program is pursuing to create a 21st century learning environment and build an ITS profession that leads the world in the innovative use of ITS technologies.

ITS Technical Assistance

The ITS PCB Program offers technical assistance resources to State and local transportation agencies, and to FHWA Field Offices.

- [ITS Peer-to-Peer Program](#) helps resolve ITS challenges by speaking to your peers.
- The ITS Help Line provides [technical support by e-mail](#) or telephone 866-367-7487.

Scheduled T3 Webinars

Register now for these upcoming T3 webinars:

Date	Time	Topic
June 23, 2011	1:00 PM – 2:30 PM ET	2011 Enhancements to the ITS Knowledge Resources Websites: Improving Access to Information on ITS Benefits, Costs, Lessons Learned and Deployment
June 29, 2011	1:00 PM – 2:30 PM ET	Open Payments, Mobile Payments and Personal Identification Verification (PIV) Acceptance – Overview of Innovations in Public Transit Payment Systems

[View T3 webinar archives](#)

News

- Act Now! [Fee Waived for June CITE Blended Course](#)
- NTI Offering: [Implementing Rural Transit Technology](#)
- T3 Webinar playback and archives now available for 1/18/2011 webinar: ["The Emergence of Open Electronic Payment Systems in Public Transit"](#)
- New NTI Course: [Implementing Contactless Fare Collection Systems](#)
- T3 Webinar Archive Now Available: [Open Source Alternative to Deploying Transportation Management Systems](#)
- T3 Webinar Archive Now Available: [TSAG Case Studies Workshop and Webinar - NG9-1-1 What's Next Forum & Webinar](#)
- Two new CITE offerings: [Road Weather Information Systems \(RWIS\) Equipment and Operations](#) and [Configuration Management for Traffic Management Systems](#)
- Added to the T3 Archives: [8/3/10 Webinar: TSAG Case Studies Workshop and Webinar — 2009 Fort Hood, Texas Army Base Shooting Incident: A Multi-Agency](#)

WWW.PCB.ITS.DOT.GOV/STANDARDSTRAINING



A202

Identifying and Writing User Needs When ITS Standards Do Not Have SEP Content



Target Audience

- Engineering Staff
- Project Managers



Instructor



Raman K Patel, Ph.D., P.E.

President

RK Patel Associates, Inc.

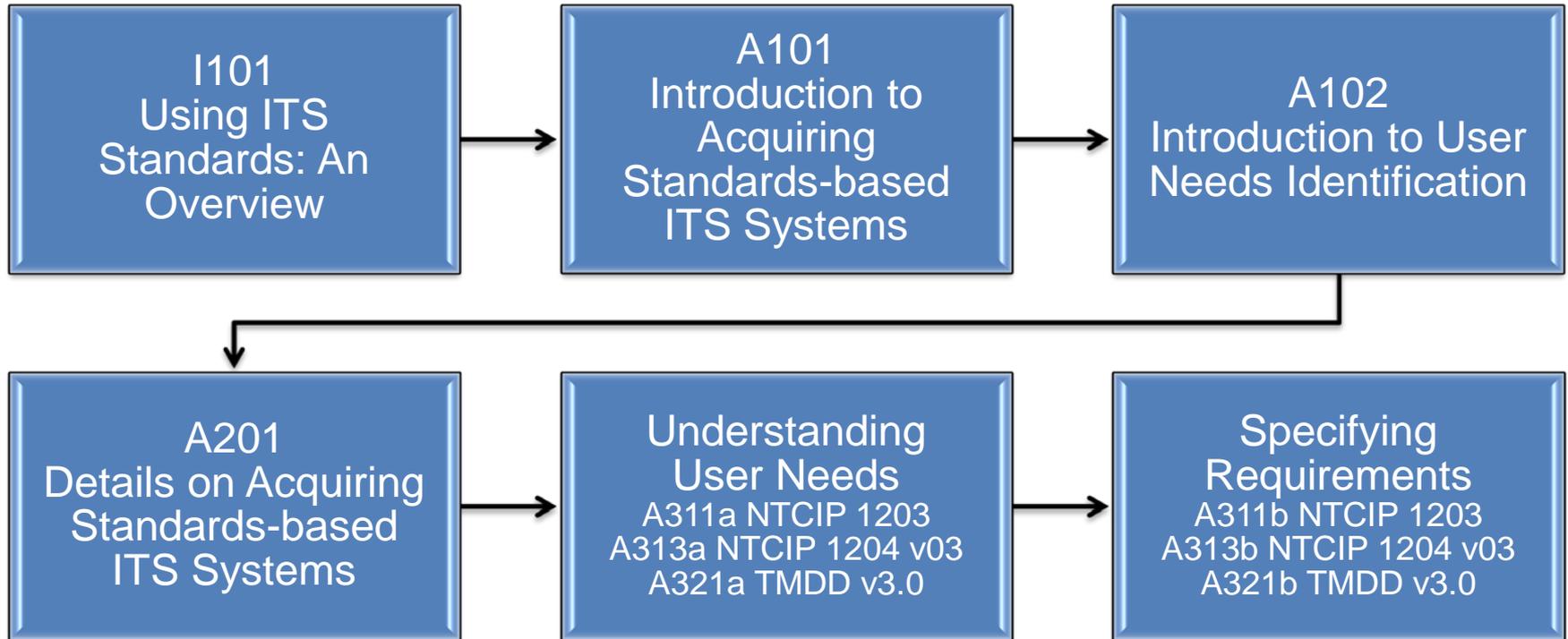
New York, NY, USA



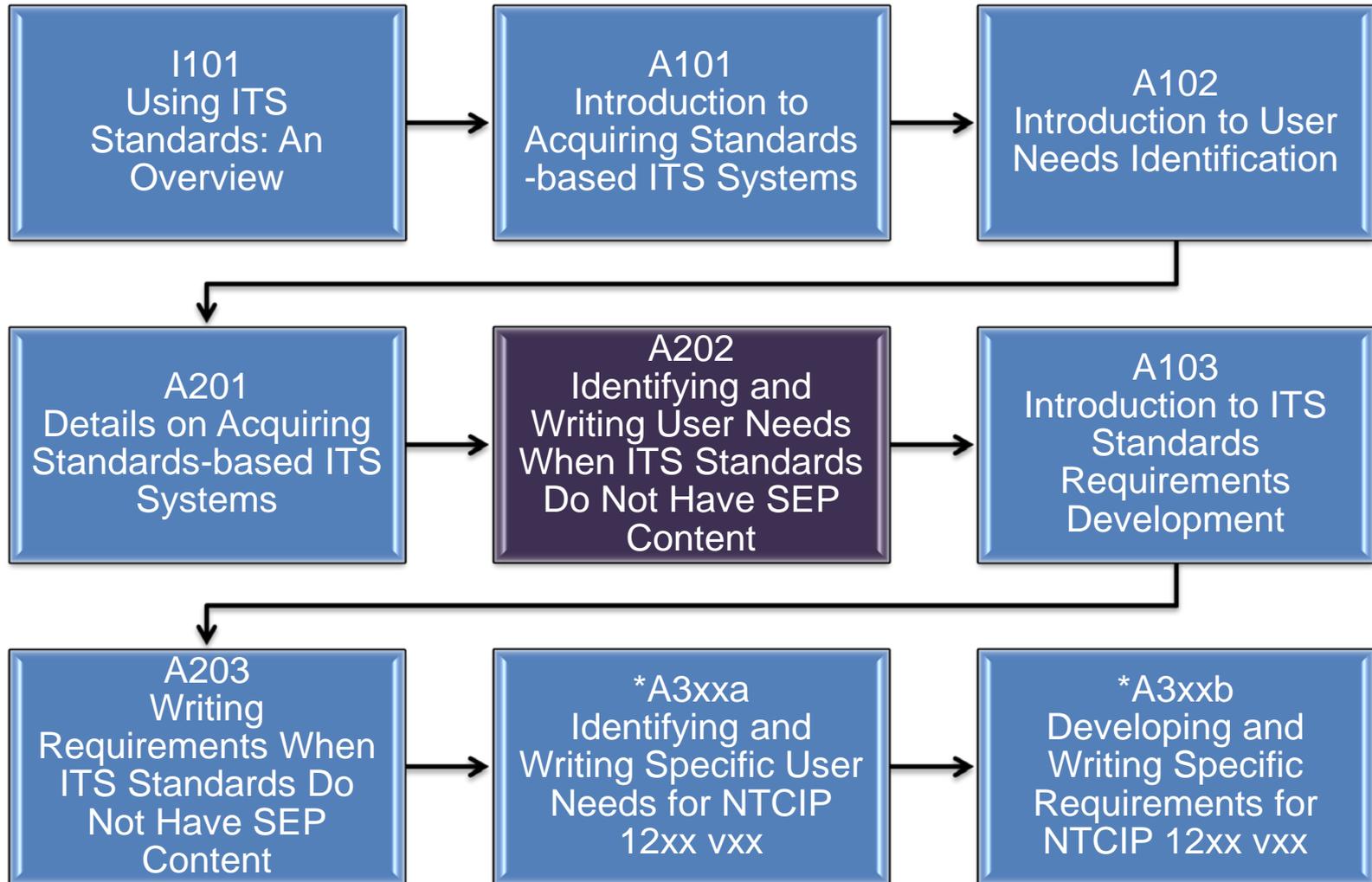
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Curriculum Path (SEP)



Curriculum Path (Non-SEP)



Recommended Prerequisites

- I101: Using ITS Standards: An Overview
- A101: Introduction to Acquiring Standards-based ITS Systems
- A102: Introduction to User Needs Identification
- A201: Details on Acquiring Standards-based ITS Systems



Recommended Prerequisites (cont.)

- Basic knowledge of the following areas is helpful:
 - Intelligent Transportation Systems (ITS)
 - Managing ITS Deployment Projects
 - Government Procurement Processes
 - Benefits of Standards
 - Systems Engineering Process (SEP)

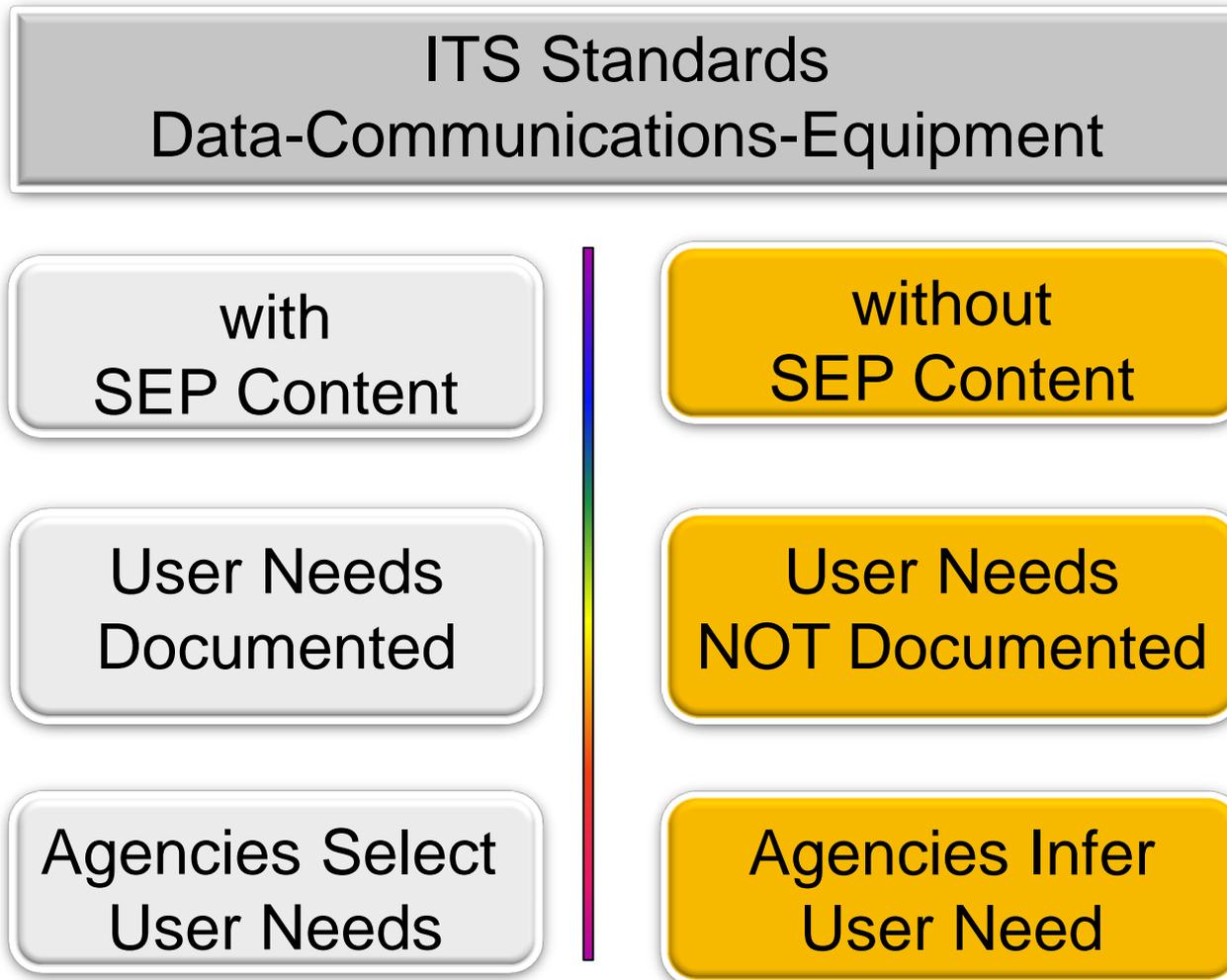


Learning Objectives

1. Understand Role of User Needs
2. Understand Structure of Standards
3. Analyze Concept of Operations for User Needs
4. Write a User Need
5. Extract User Needs from other Relevant Standards
6. Validate User Needs



Understanding Role of User Needs



A102-A201

A202

How do Standards Support Operational Needs?

- NTCIP device standards provide the interface to facilitate remote access of the field devices to:
 - Configure the device
 - Monitor the device
 - Control the device (functions)
 - Retrieve information from the device
- System standards provide the interface to conduct information exchanges among centers

NTCIP Device Standards

Facilitate Remote Access of the Field Devices

Standards with SEP Content

Standards without SEP Content

Environmental Sensor Stations



Actuated Signal Controllers

Dynamic Message Signs



CCTV Cameras

Electrical Lighting Management Systems



Ramp Meter Control Units

Signal Control Priority



Data Collection & Monitoring

Traffic Sensor Systems



Video Switching

Work in progress,
Field Management Stations Part 1 for SSM



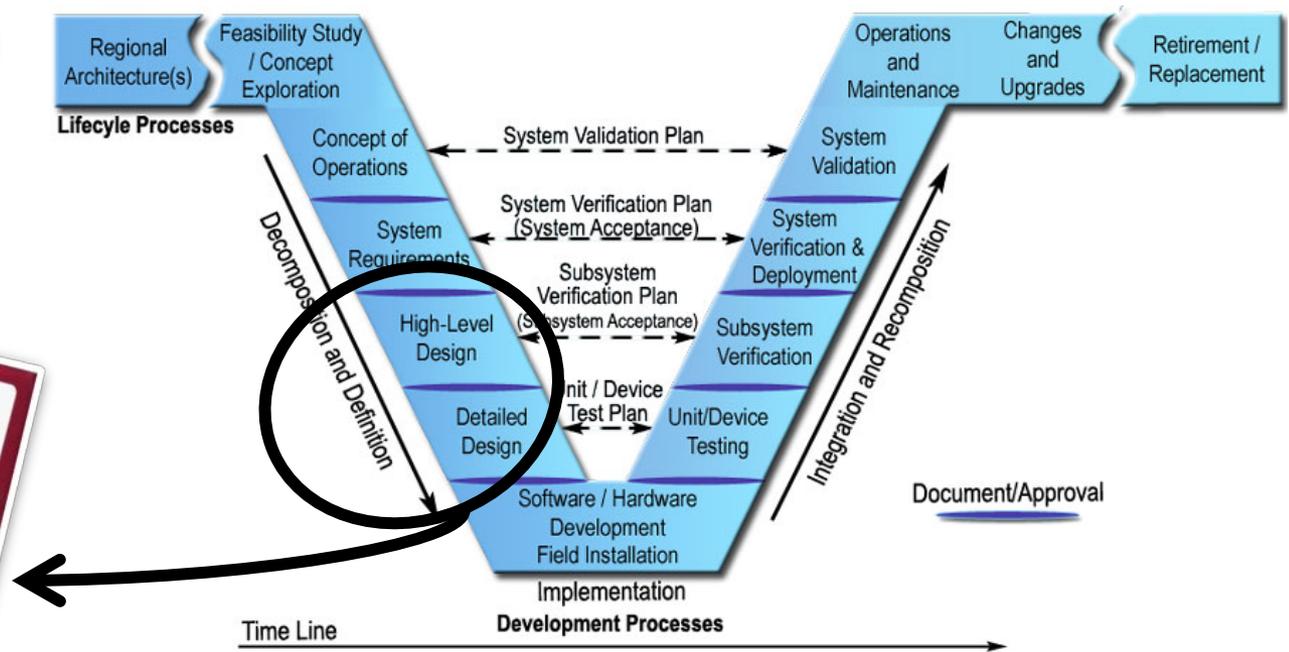
Network Cameras



Center to Field (C2F)

Where do Standards Fit?

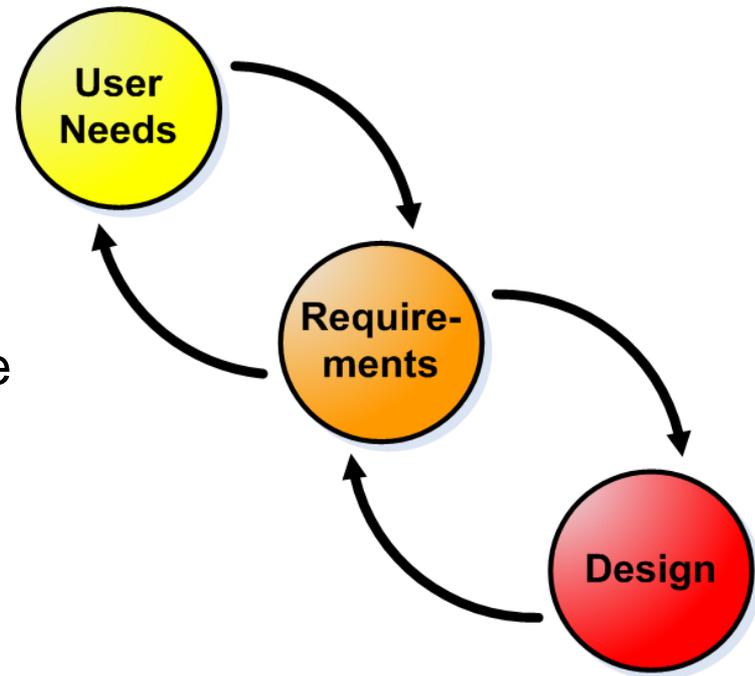
Mixed use of Device & System Standards



What Should be in a Specification?

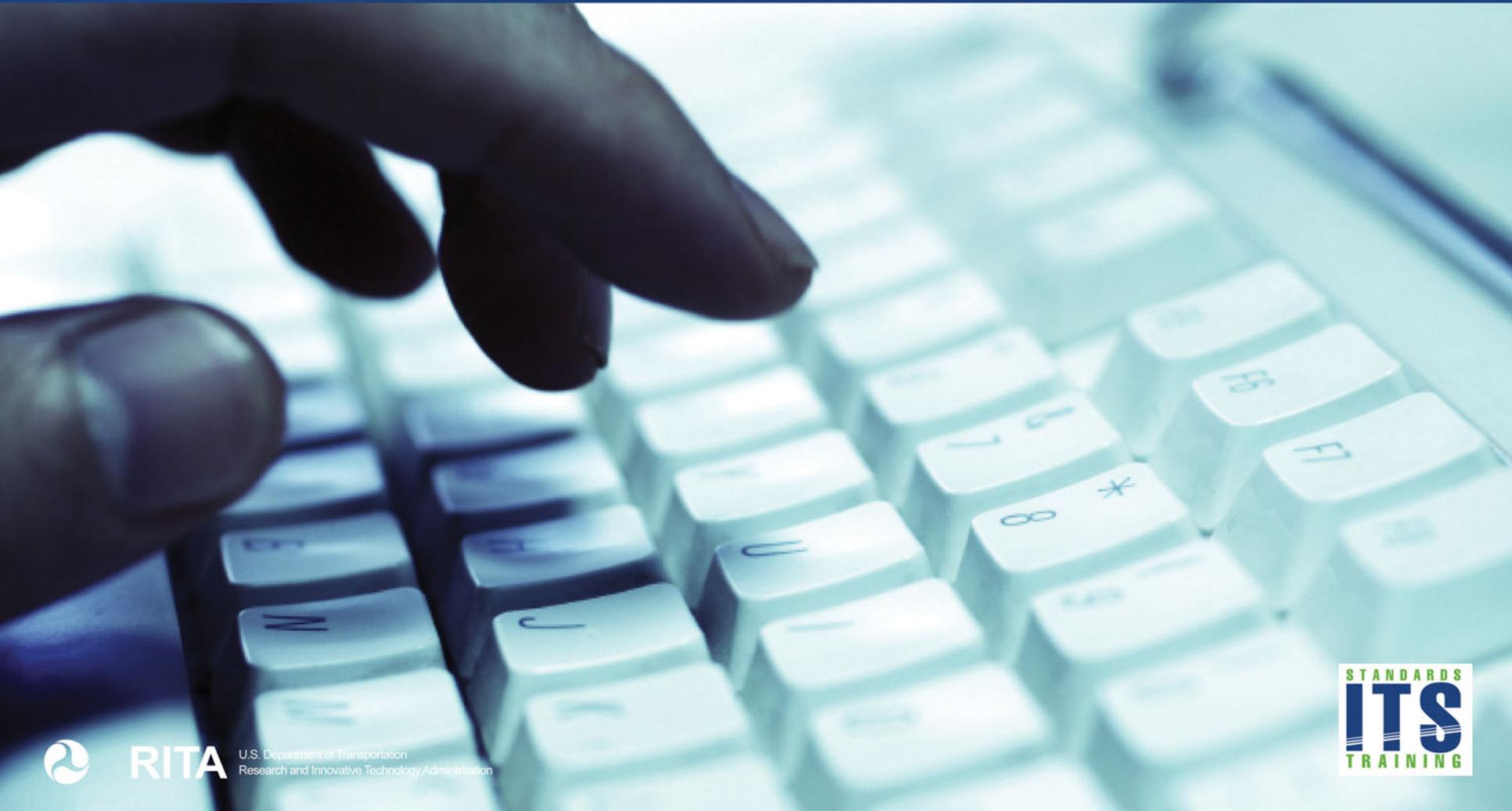
Description of what the interface must do to support operations (features-functions)

Written in “*shall*” language specific functional requirements to satisfy user needs



Allocation of only standard-supplied design data concepts-objects to fulfill the stated requirements

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Problem Definition

What should we do when user needs do not already exist?

Enter your response in the chat pod



Develop User Needs When They do not Already Exist

- Module A102 focused on user needs
- Certain standards do not have user needs
- We must first discover them from various sources and standards, and then write them



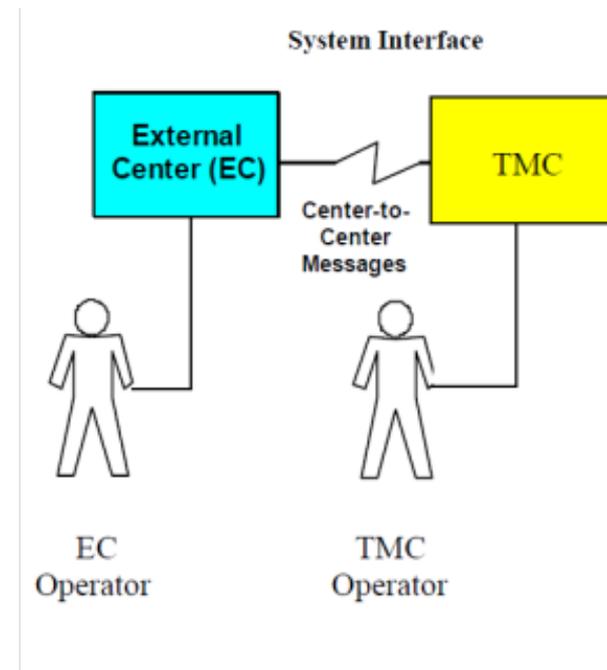
Why do we Have to Write User Needs?

- Allow tracking development at all stages
- They eliminate “*guessing or assuming*” by developers
- Other reasons.....



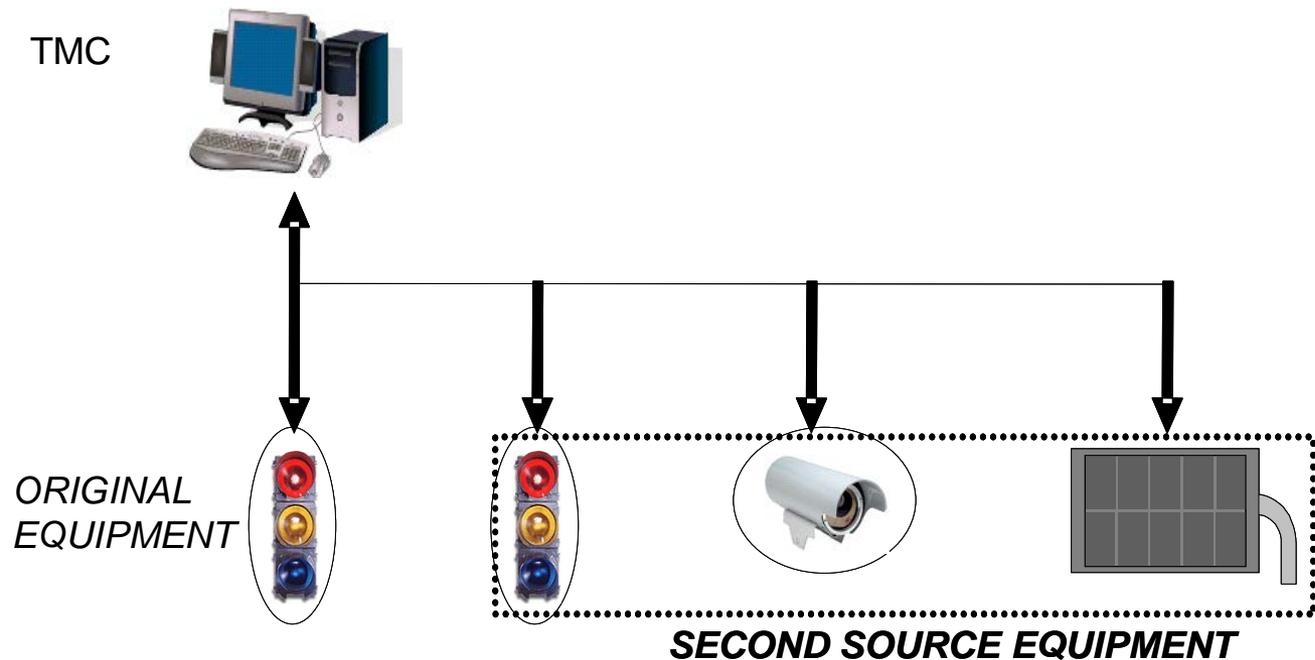
Other Reasons Consideration for Interoperability

- TMC may need to communicate messages with external centers in the region involving field devices

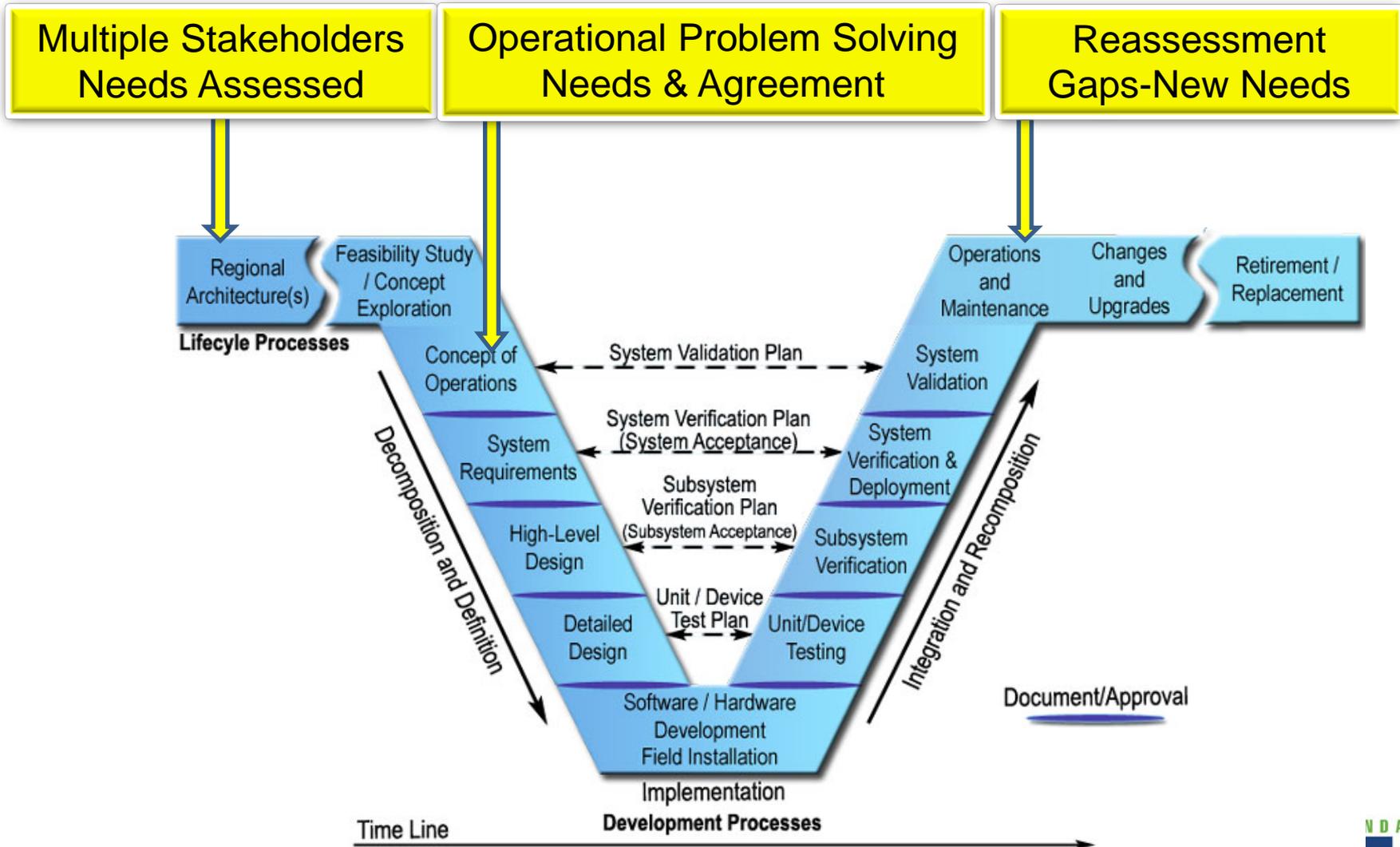


Other Reasons Consideration for Vendor Independence

- Agencies desire multiple (devices/parts) suppliers, interchangeability



User Needs Locations on "V" Model



Users' Perspective

- What the system must do to support operational needs:

- Features/functions

Basis for development

- Support for:

- Operation Staff-TMC Operators
 - Traffic and System Engineers
 - System Maintenance

Basis for utilization

Understanding Structure of Standards (1)

- SEP-based Standards provide the following Documented Content:



Example of SEP-based Content

user need

2.5.2.5 Monitor Water Level

A transportation system operator may need to monitor the depth of water at one or more locations (e.g., over a roadway, in a stream, of a reservoir, etc.).

requirement

3.5.2.3.7 Retrieve Water Level

Upon request, the ESS shall return the current depth of water at defined locations (e.g., over a roadway, in a stream, of a reservoir, etc.).

design

Req ID	Dialog	Requirement	Object ID	Add'l Requirements/Object
3.5.2.3.7	F.4.6	Retrieve Water Level		
			5.8.19	waterLevelSensorTableNumSensors
			5.8.21.1	waterLevelSensorIndex
			5.8.21.2	waterLevelSensorReading

Source: NTCIP 1207 ESS standard



Understanding Structure of Standards (2)

- Non-SEP-based Standards Provide Documentation for:

Design Concepts

Some designs such as dialogs may be missing

- We will learn to explore and distinguish user needs from requirements that drive the design

Device Standard with SEP Content

Table of Content

Section 1: Concept of Operations/User Needs

Section 2: Functional Requirements

Section 3: Dialogs

Section 4: Management Information Base-**MIB**

Section 5: Protocol Requirements List-**PRL**



Example of Standard with SEP: NTCIP 1203 v3.03 April 2011

Section 1 GENERAL [Informative].....	1
Section 2 CONCEPT OF OPERATIONS [Normative]	19
Section 3 DMS FUNCTIONAL REQUIREMENTS [Normative]	32
Section 4 DIALOGS [Normative].....	98
Section 5 MANAGEMENT INFORMATION BASE (MIB) [Normative]	132
Section 6 MARKUP LANGUAGE FOR TRANSPORTATION INFORMATION (MULTI) [Normative] ..	215
Annexes	



Device Standard without SEP Content

Table of Contents

Section 1: Overview

Section 2: General

Section 3: Management Information Base-MIB

Section 4: Conformance Groups (CGs)



System Standard Without SEP Content

Example

Table of Content

Section 1: Requirements

Section 2: Dialogs

Section 3: Message Sets

Section 4: Data Frames-Data Elements

1512.2™

IEEE Standard for Public Safety
Traffic Incident Management
Message Sets for Use by
Emergency Management Centers

Recap

- User Needs:
 - Discussed in Module A102
 - Form the basis for system development
 - Create a path (first step) to interoperability and vendor independence
- We have learned to explore the structure of a standards to prepare specification



POLLING



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Has Your Region Developed a Regional Architecture?



Analyzing ConOps for User Needs

- ConOps Reveals a “Big Picture”:
 - What is the current situation or problem?
 - Who are the users? Who is affected?
 - What are the operational scenarios?
 - Are there any regional aspects?



Where to Find User Needs

- ConOps/Project Concept
- Operational Scenarios
- Regional Architecture



Where to Find User Needs (cont.)

- Stakeholders-Interviews
- Assessment Workshops
- Case Studies-Lessons



What to Look for in a ConOps?

- What you want to do operationally?
- Specific systems and their intended uses
- What are the expected regional interactions?



Operational Scenarios

- Scenarios are key part of ConOps:
 - What is to be done? (Task)
 - Who will do what? (Roles)
 - What is to be communicated? (Information)
- Scenarios are managed using Standard Operating Procedures (SOPs)
 - Based on lessons learned from the past events
 - Carried out by TMC operators



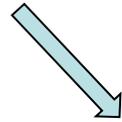
Summary

- We know how to identify user needs from:
 - Regional architecture documents and stakeholders
 - ConOps and operational scenarios
 - Other standards

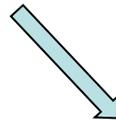


Steps to Writing a User Need

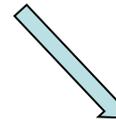
A **Operational Needs**



B **ITS Standard**



C **Extraction Process**

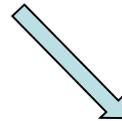


D **Writing Criteria**

Example: Exploring the Standard

Operational Need

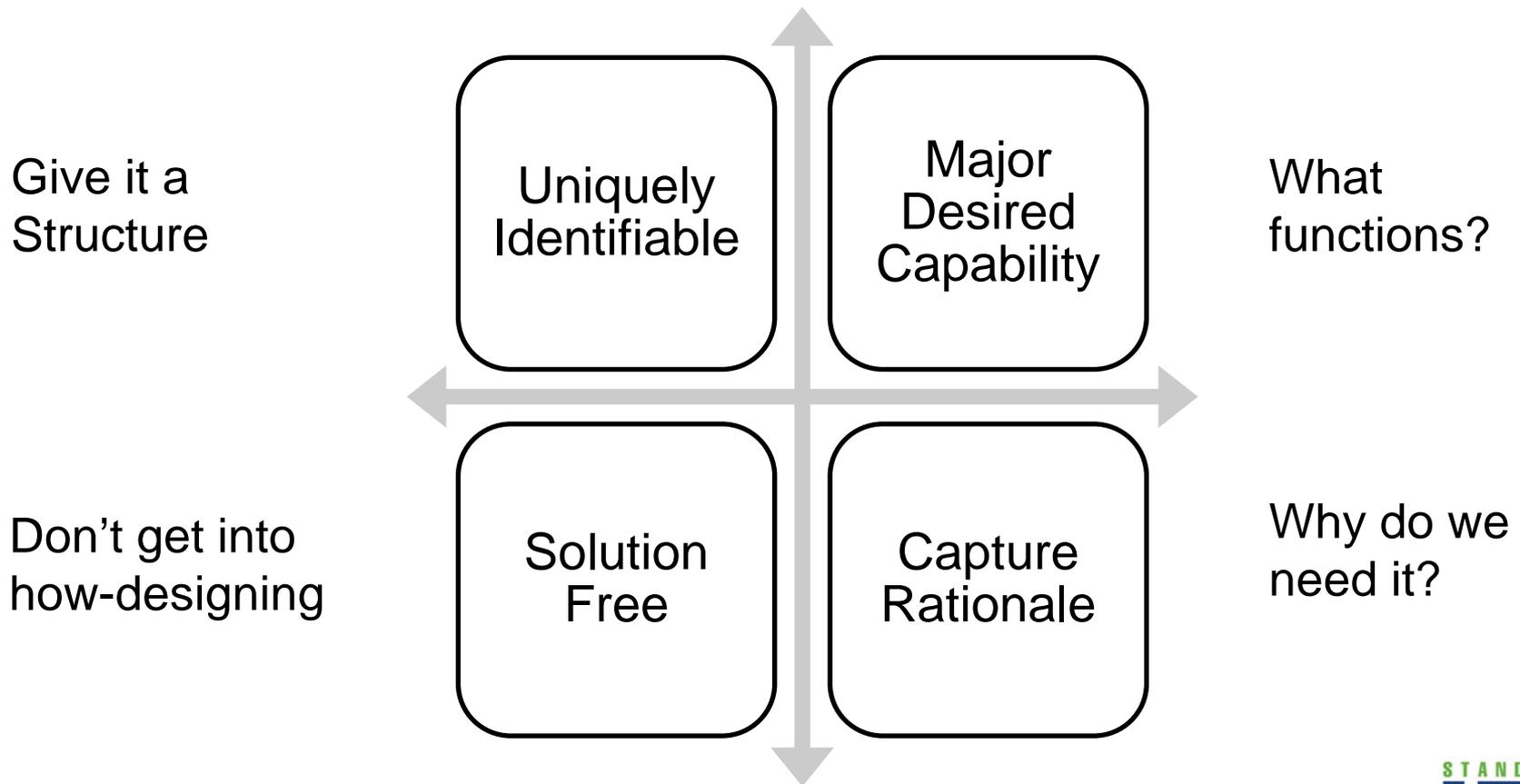
A Desire to control CCTV cameras from multiple locations during traffic incident management



B **NTCIP 1205 CCTV**

Criteria for Writing a User Need (D)

Step "C" is discussed later



User Need (Structure)

UN ID

UN Title

UN 1.1

Control a CCTV camera from more than one location

Uniquely Identifiable throughout the project development

Reflects the purpose and the context of an operation

Allows tracing of the requirements and helps to validate a “built” system/device



User Need (Meaning)

write a major desired capability

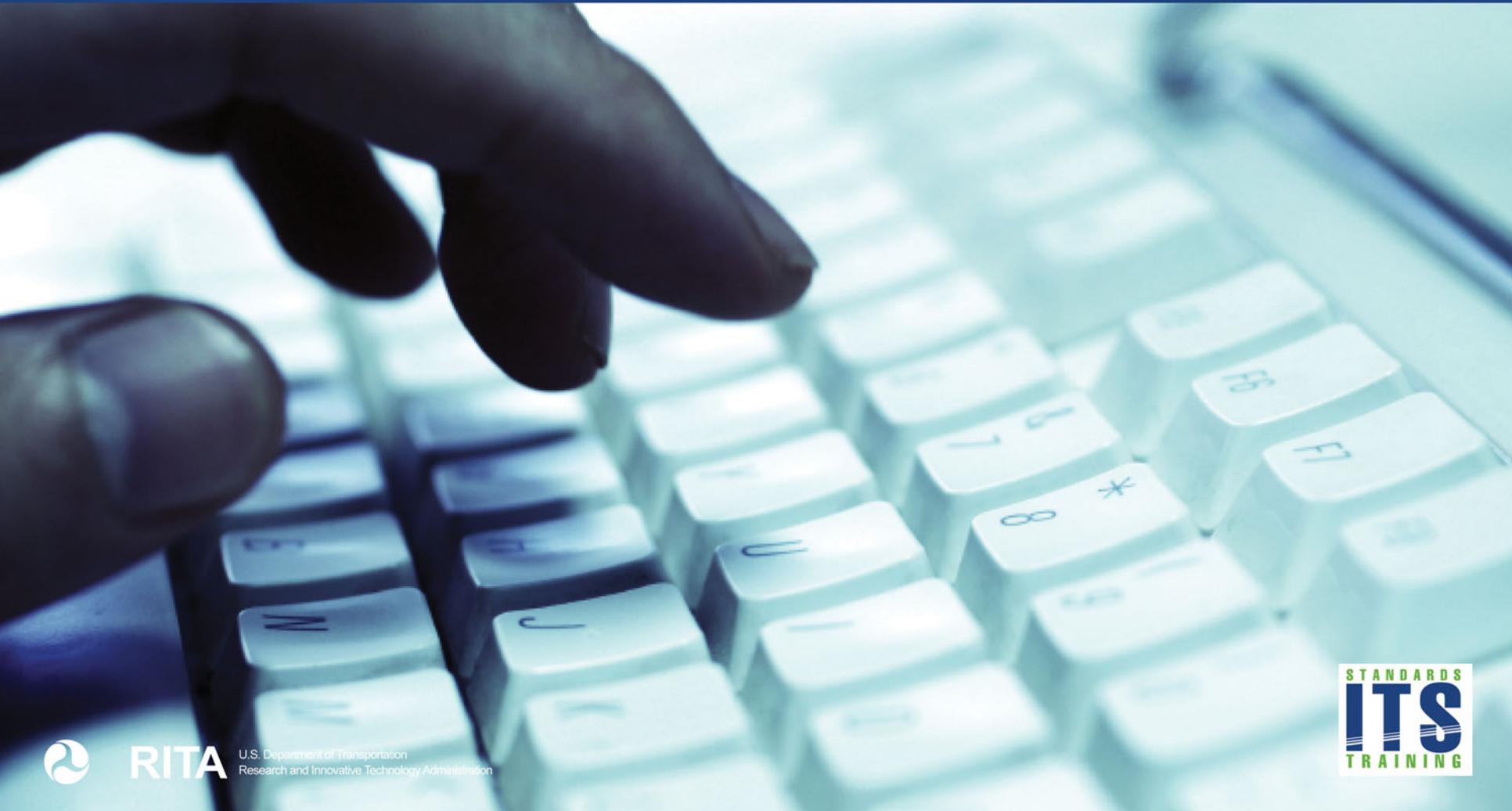
*“This feature addresses the need for a CCTV camera to be **controlled remotely** from one or more locations on roadways to **manage congestion** in the region.”*

Capture a rationale

keep it solution-free



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Name a standard without SEP content

Enter your response in the chat pod



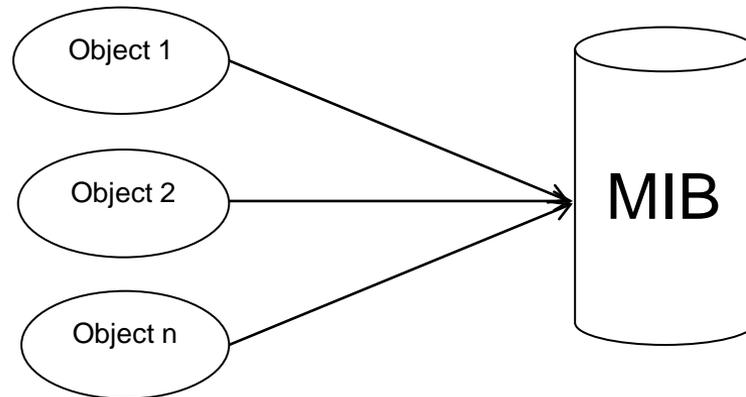
Extracting User Needs from Relevant Standards

How should we do this?



Management Information Base (MIB)

- MIB contains related **objects** definitions
- Objects represent management information



e.g. CCTV MIB contains 70 objects in lexicographical order of their OBJECT IDENTIFIERS correspond to their physical location in the global naming tree (12 nodes).

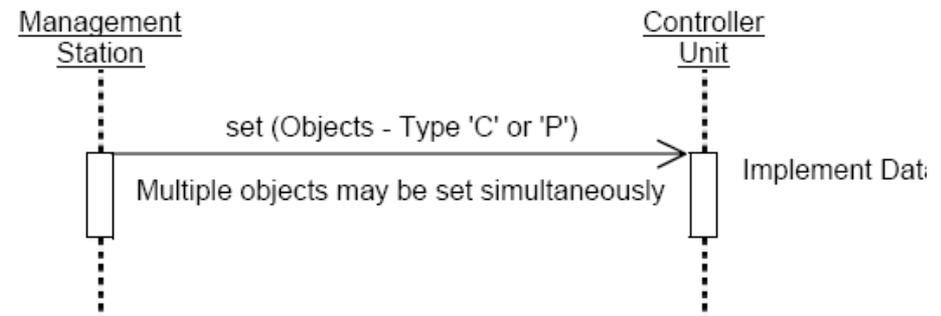
Purpose of Objects

- NTCIP Objects are designed to be managed (manipulated) for configuring the device, monitoring the device and controlling the device

Example:

(SET is one of the commands used to “tell” the device what to do)

- C Control Objects
- P Parameter objects



Structure of an Object

- **Defined by the Abstract Syntax Notation 1 Language (ASN.1)**

1. Object's name
2. Data type value range
3. Read-write only
4. Conformance requirement
5. Human readable description, purpose
6. Object Identifier (OID)

3.2.1 maximum number of Presets parameter

rangeMaximumPreset OBJECT-TYPE

SYNTAX **INTEGER (0...255)**

ACCESS read-only

STATUS mandatory

DESCRIPTION "A preset is the pre-specified position where a camera is pointed to a fixed point in space....."

::={**cctvRange1**}

Managed Object

(ASC example)

1. To manage an object the Standard assigns a wide range of values to select from as needed: e.g. **8** phases traffic controller is required

maxPhases OBJECT-TYPE

SYNTAX INTEGER (2..255)

ACCESS read-only

STATUS optional

DESCRIPTION

"<Definition> The Maximum Number of Phases this Actuated Controller Unit supports. This object indicates the maximum rows which shall appear in the phaseTable object.

<DescriptiveName> NTCIP-1202::ASC.maxPhases

<DataConceptType> Data Element

<Unit> phase"

::= { phase 1 }

2. To manage this object the Standard has fixed its location on the Internet tree of nodes by providing an unique ID number

Summary of what an object does

- Data content is a Pairing of [*OID*, *Value*]
 - Fulfills a requirement (design)
 - Becomes part of the message sent to the device to perform a desired action
- Future PCB module will cover this topic



Conformance Group (CG)

- A CG is a logical grouping of **related objects**.
- CG helps in determining required objects to support a function.
- One CG for one function



Conformance Group (CG)

Example: *Motion Control CG*

Lists objects necessary to meet user requirement for the remote control of a camera

Objects are gathered from the MIB

They form a logical grouping

- *presetGotoPosition*
- *presetStorePosition*
- *positionPan*
- *positionTilt*
- *positionZoomLens*
- *positionFocusLens*
- *positionIrisLens*

Conformance Group (cont.)

- CGs are used to check the conformance to the standard:
 - **Mandatory** CGs must be selected
Example: CCTV Configuration
 - **Optional** CGs may be selected by user
Example:
 - Extended Functions
 - Motion Control
 - On-Screen Menu Control

(Suggested) Extraction Process (C)



**Conformance
Groups**

MIB (Objects)

**Categories of
Functions**

Functionality

**Major Desired
Capability**

**Requirement
Design**

READ

Identify Standard: NTCIP 1205

Table 4-2: Conformance Statement Table

CONFORMANCE GROUP	REFERENCE	CONFORMANCE REQUIREMENT
Configuration	NTCIP 1201:1996	mandatory
Database Management	NTCIP 1201:1996, Amendment 1	optional
Time Management	NTCIP 1201:1996, Amendment 1	optional
CCTV Configuration	NTCIP 1205	mandatory
Extended Functions	NTCIP 1205	optional
Motion Control	NTCIP 1205	optional
On-Screen Menu Control	NTCIP 1205	optional

There are
4 CGs



Source: NCIP 1205 v1 pages 4-5



RECOGNIZE

4.1.1 CCTV Configuration Group	page 4-2
4.1.2 Extended Functions Conformance Group	page 4-2
4.1.3 Motion Control Conformance Group	page 4-3
4.1.4 On-Screen Menu Control Conformance Group	page 4-4

We recognize that these four CGs represent four major functionalities.

These four CGs collect 70 objects (design) from 12 listed categories under CCTV MIB.(NTCIP 1205)



INFER

Potential User Needs

- Review Operational Context:
 - Provide CCTV functions to support traffic management in the region.
- Outline Desired Features:
 - The features identify and describe the various functions that users may want the device to perform. These features are derived from the high level user needs identified in the problem statement



INFER

- Potential CCTV User Needs (partial list)
 1. TMC operator may need to configure a CCTV device
 2. TMC operator may need to control the features within a CCTV
 3. TMC operator may need to control Pan-Tilt-Zoom features to position the camera
 4. TMC operator may need to activate the internal camera menu and manipulate control parameters
- User needs can be broken down as sub-needs

ASC Example

- Operational context:
 - Remote access from TMC to Configure, Monitor, and Control ASC for:
 1. Intersection Control
 2. Overlap
 3. Coordination (local)
 4. Coordination (central)
 5. Priority/Preemption
 6. Reporting
 7. Special Functions
 8. Intra-cabinet Communications



NTCIP 1202 v02 ASC

- 15 CGs are categorized as per functional areas
- A.3 and A.4 are Mandatory for Conformance

Ref	Areas	Clause of Profile	Status	Support
A.3	Phase Conformance Group	NTCIP 1202 - 2.2	M	Yes
A.4	Detector Conformance Group	NTCIP 1202 - 2.3	M	Yes
A.5	Volume Occupancy Report Conformance Group	NTCIP 1202 - 2.3	O	Yes / No
A.6	Unit Conformance Group	NTCIP 1202 - 2.4	O	Yes / No
A.7	Special Function Conformance Group	NTCIP 1202 - 2.4	O	Yes / No
A.8	Coordination Conformance Group	NTCIP 1202 - 2.5	O	Yes / No
A.9	Time Base Conformance Group	NTCIP 1202 - 2.6	O	Yes / No
A.10	Preempt Conformance Group	NTCIP 1202 - 2.7	O	Yes / No
A.11	Ring Conformance Group	NTCIP 1202 - 2.8	O	Yes / No
A.12	Channel Conformance Group	NTCIP 1202 - 2.9	O	Yes / No
A.13	Overlap Conformance Group	NTCIP 1202 - 2.10	O	Yes / No
A.14	TS 2 Port 1 Conformance Group	NTCIP 1202 - 2.11	O	Yes / No
A.15	Block Object Conformance Group	NTCIP 1202 - 2.12	O	Yes / No

Additional CGs are also needed from other standards
(see NTCIP 1202 v02-2005 standard page 135)

List of User Needs for ASC

Source: NTCIP 1202 v02, page 135

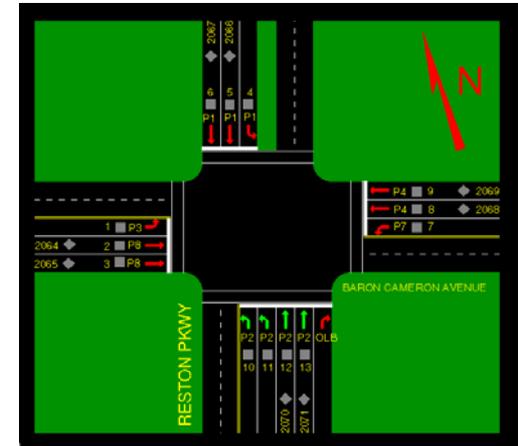
UN	User Need	Mapped to these CG	
1	Intersection Control	<ul style="list-style-type: none"> • A.3 Phasing • A.4 Detector • A.6 Unit • A.11 Ring 	<p>Mandatory</p> <p>Mandatory</p> <p>Optional</p> <p>Optional</p>
2	Overlap	<ul style="list-style-type: none"> • A.13 Overlap 	Optional
3	Coordination (local)	<ul style="list-style-type: none"> • A.17 Time Management • A.18 Time Event Schedule 	<p>Optional</p> <p>Optional</p>
4	Coordination (central)	<ul style="list-style-type: none"> • A.5 Volume Occupancy • A.3 Phase 	<p>Optional</p> <p>Optional</p>
5	Priority/Preemption	<ul style="list-style-type: none"> • A.10 Preempt • A.7 Special Function 	<p>Optional</p> <p>Optional</p>
6	Reporting	<ul style="list-style-type: none"> • A.19 Report 	Optional
7	Special Functions	<ul style="list-style-type: none"> • A.7 Special Function 	Optional
8	Intra-cabinet Communications	<ul style="list-style-type: none"> • A.12 Channel • A.14 TS 2 Port 2 	<p>Optional</p> <p>Optional</p>



Writing a User Need for ASC

UN 1.1 Maximum Number of Phase

The system owner needs to be able to manage the operation of the ASC at an intersection that may require support for minimum of eight phases to assign right of way, including pedestrian movements. This includes the ability to program in any combination of 2-8 phases.



Note 1: This UN is Mandatory as per CG A.3 of the ASC standard

Note 2: UN is written with ID, title, a major capability, with rationale and it is free of design that is it doesn't say how it is to be met

Writing a User Need for CCTV

UN 1.1 Control a Remote CCTV Device

To support an area-wide surveillance of a roadway section a TMC operator may need to remotely access the CCTV device presets and control pan/tilt/zoom (PTZ):

- *Zoom and Focus Position Preset*
- *Tilt angle from = +40 to -90 deg.*

Uniquely Identifiable
with ID + title

User Need with Major
Desired Capability

Rationale

Solution-free



Writing User Needs Based on a Scenario

Incident Management

“ a TMC operator receives information on a traffic incident and creates an incident report. The operator determines a list of centers who are affected, then begins to inform centers.....At some point motorists must be informed.....media informed...”

UN # 1 Share incident information with the motorists

UN # 2 Provide warnings to the public

UN # 3 Share information with relevant authorized centers



Writing a User Need for Emergency Management

Example of IEEE 1512 Family of Standards

UN 1.1 Share Incident Information with First Responders

An EM center operator may need to know about the roadway incident (in real-time) to be able to make decision and dispatch first responders to the location immediately thereafter, resulting in improved incident response times thus saving lives.

- This User Need meets the following criteria:
 1. Uniquely Identifiable with ID + Title
 2. User Need with Major Desired Capability
 3. Rationale
 4. Solution-free



Acknowledging Risks

- Extraction process has some risks:
 - Two users may end up with different inferences
 - Interoperability may be hurt
 - Missing data must be developed



Traceability with CGs

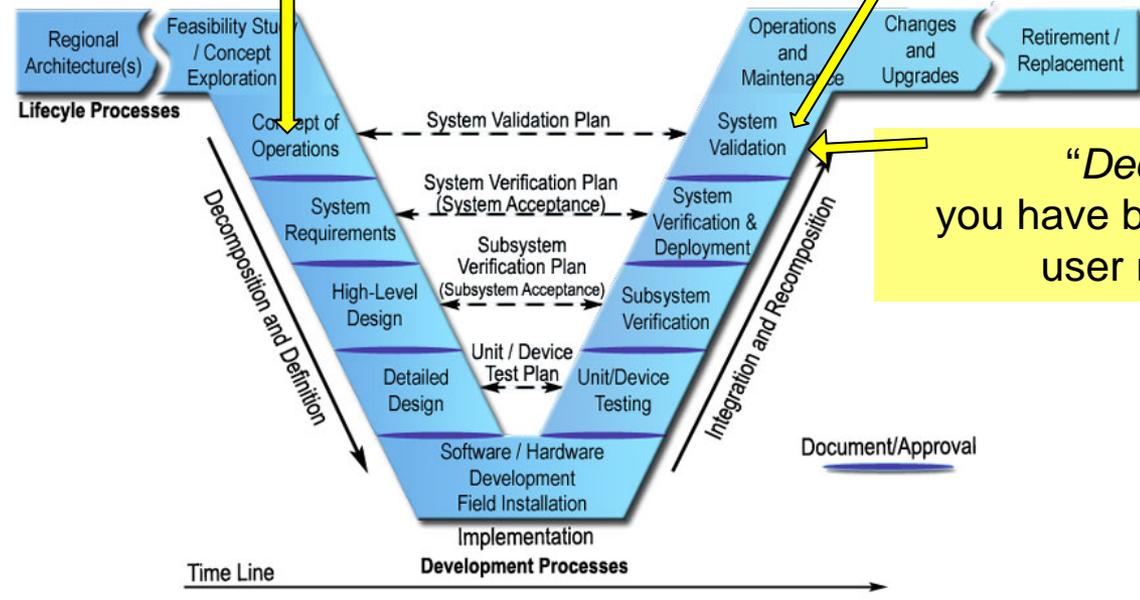
- Ensures that user needs are met
- Ensures that objects are selected for requirement(s)

User Need ID	User Need ←	Conformance Group	→ Requirement	Objects Support
1.1	Provide Remote Control....Zoom	4.1.1 CCTV Configuration	Provide a lens with capabilities for remote control of zoom operations	3.2.8 <i>rangeZoomlimit</i> 3.3.3 <i>timeoutZoom</i>
		4.1.3 Motion Control	Provide mode of operation, stop movement, and offset measurements	3.5.3 <i>postionZoomlens</i>

Validating User Needs

Validation strategy is part of a ConOps Plan

Contains performance measures to assess outcomes



“Declare Victory”
you have built the right thing...
user needs are met

Focus is on User Needs at all stages

What Have We Learned Today?

1. When user needs don't already exist; we have to develop them
2. User needs are a first step towards achieving interoperability and interchangeability
3. User needs can be found in a ConOps plan
4. User needs can be derived from operational scenarios, which are part of a ConOps plan



What Have We Learned Today? (cont.)

5. Non-SEP based standard's structure provide **Conformance Groups (CGs)** and **Management Information Base (MIB)**
6. This course taught us a four step extraction process: **Read**, **Recognize**, **Infer** and **Write**.



What Have We Learned Today? (cont.)

7. User needs must be written using a prescribed criteria:

Uniquely Identifiable

Major desired Capability

Capture Rationale

Solution-free

8. System is **Validated** with user needs



Next Module: A203

Writing Requirements When ITS Standards Do Not Have SEP Content

- The participants will learn to:
 - Identify different types of requirements.
 - Understand that requirements development is a process.
 - Avoid pitfalls when writing requirements.
 - Write requirements when an ITS communication standard does not have SEP information.
 - Use traceability matrices as tools for requirements development.



Student Supplement

Table of Contents

Learning Objectives

- Understand Role of User Needs
- Understand Structure of Standards
- Analyze Concept of Operations for User Needs
- Write a User Need
- Extract User Needs from other Relevant Standards
- Validate User Needs

References



Additional Information Sources

- *Systems Engineering for ITS Handbook*, FHWA
- NTCIP Guide
- TMDD Guide
- IEEE 1512 Implementation Guide



QUESTIONS?



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Here are some questions....

- What is the difference between compliance and conformance?
- What is the difference between validation and verification process?
- Will there be training courses on CCTV or ASC type of devices?

